CHANGES IN MATHEMATICS TEACHING METHODS BETWEEN RESEARCH LESSON PLANNING AND OBSERVATION IN THREE TAMIL PRIMARY SCHOOLS

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by

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ABSTRAK

Kajian ini bertujuan untuk meneroka perubahan dalam amalan pengajaran matematik semasa proses "Lesson Study" (*LS*) di tiga buah Sekolah Jenis Kebangsaan Tamil daripada tiga buah negeri di Malaysia. Dalam kajian ini, amalan pengajaran matematik merujuk kepada penyediaan rancangan pengajaran serta pengajaran matematik dalam kelas. Dua objektif utama kajian ini ialah (i) untuk mengenalpasti tren perubahan kaedah pengajaran matematik berdasarkan penyediaan rancangan dan pemerhatian pengajaran kajian; (ii) untuk membanding perubahan kaedah pengajaran matematik antara tiga buah sekolah rendah berdasarkan penyediaan rancangan dan pemerhatian pengajaran kajian. Kajian kualitatif ini menggunakan rekabentuk kajian kes. Terdapat tiga kumpulan *LS* daripada tiga buah sekolah kajian iaitu seramai sembilan orang guru matematik yang berpengalaman dan novis sebagai peserta kajian. Peserta kajian menyertai tiga kitaran proses "Lesson Study" yang merangkumi merancang secara kolaborasi, membuat pemantapan, mengajar, memerhati, membuat refleksi dan merancang semula sesuatu rancangan matematik kajian. Pelbagai sumber data kualitatif telah dikumpul termasuk rancangan pengajaran kajian, pemerhatian pengajaran kajian, sesi pemantapan rancangan pengajaran kajian, dua sesi temubual secara individu dengan peserta kajian dan sesi refleksi pengajaran kajian secara pos. Analisis data telah mengenalpasti beberapa kekukuhan dan kelemahan semasa pelaksanaan proses "Lesson

Study". Peserta kajian telah diperhatikan menyedari akan kepentingan perancangan pengajaran secara teliti, mengenalpasti kaedah-kaedah pengajaran matematik yang sesuai, menfokus kepada kemahiran–kemahiran pemerhatian dan keperluan refleksi pengajaran secara pos semasa pelaksanaan proses "Lesson Study". Walau bagaimanapun, peserta kajian juga telah menyatakan beberapa kelemahan berkaitan proses "Lesson Study" seperti kekurangan kolaborasi dalam kalangan peserta kajian semasa merancang dan memerhati pengajaran. Dapatan kajian ini juga menunjukkan lima perubahan dalam kedua-dua perancangan dan pemerhatian pengajaran kajian: (i) mendalami pengetahuan dan pemahaman guru-guru matematik dalam kemahiran merancang pengajaran; (ii) menggalakkan kolaborasi yang kuat dalam kalangan rakan guru untuk menghasilkan rancangan pengajaran matematik yang berkualiti; (iii) menggunakan pelbagai kaedah pengajaran dalam rancangan dan pemerhatian pengajaran kajian; (iv) menggalakkan guru-guru menjana kaedah-kaedah pengajaran yang baru dalam rancangan dan pemerhatian pengajaran kajian; dan (v) memerhatikan perubahan dalam kepercayaan dan tingkahlaku guru-guru terhadap rancangan dan pemerhatian pengajaran kajian. Walau bagaimanapun, peserta-peserta kajian ini telah menekankan bahawa faktor masa adalah kekangan utama untuk mengekalkan penglibatan yang berterusan dalam proses "Lesson Study". Oleh yang demikian, kitaran proses "Lesson Study" tambahan diperlukan untuk mendapatkan perubahan-perubahan dan impak yang positif dalam amalan pengajaran matematik.

CHANGES IN MATHEMATICS TEACHING METHODS BETWEEN RESEARCH LESSON PLANNING AND OBSERVATION IN THREE TAMIL PRIMARY SCHOOLS

ABSTRACT

This study aimed to explore the changes in mathematics teaching practices during Lesson Study (LS) process in three Tamil primary schools in three different states in Malaysia. In this study, mathematics teaching practices referred to planning and teaching a mathematics lesson in the classroom. This study sought to achieve two research objectives: (i) to identify the trend of changes in mathematics teaching methods in terms of research lesson planning and research lesson observation; and (ii) to compare the changes in mathematics teaching methods among three primary schools in terms of research lesson planning and research lesson observation. This study employed a qualitative case study research design. There were three LS teams from three Tamil schools with a total of nine experienced and novice mathematics teachers participated in this study. The participant teachers completed three LS cycles comprising collaborative planning, refining, teaching, observing, reflecting and re-planning the particular mathematics research lesson. Multiple sources of qualitative data were collected consisting of respectively lesson plans, lesson observations; and lesson plan refining sessions; two individual participant teachers' interviews and post lesson reflection sessions. The analysis of the data identified some strengths and weaknesses during the implementation of Lesson Study process. The participant teachers were observed realized on the importance of careful lesson planning, identifying appropriate teaching

methods, focusing on the observing skills and the need of post-lesson reflections during the implementation of Lesson Study process. However, participant teachers also indicated some weaknesses regarding Lesson Study process such as lack of collegial collaborations during lesson planning and lesson observations. The findings of this study also revealed five visible changes in both mathematics lesson planning and lesson observations: (i) developing mathematics teachers' understanding and knowledge in lesson planning; (ii) enhancing stronger collegial collaborations to produce quality mathematics lesson plans; (iii) employing various teaching methods in lesson planning and lesson observations; (iv) generating new teaching methods in lesson planning and lesson observations; and (v) observing changes in teachers' beliefs and attitudes during lesson planning and lesson observations. Yet, the participant teachers in this study stressed that time was the major limitation factor to sustain a continuous participation in Lesson Study process. Therefore, additional Lesson Study cycles are needed to obtain positive changes and impacts in mathematics teaching practices.

CHAPTER ONE

INTRODUCTION

This study aims to explore the changes in mathematics teaching methods between research lesson planning and observation during the implementation of Lesson Study process, a Japanese teacher professional development model in three Tamil primary schools. The study also seeks to identify teachers' insights includes the constraints, challenges and impacts of Lesson Study process after its implementation.

Teaching practices consists of various teaching methods or strategies used by the teachers and educators to deliver their content knowledge and pedagogical content knowledge during teaching and learning processes in the classroom. According to Boundless (2006), effective teaching methods could help to activate pupils' curiosity about a lesson topic, engage pupils in learning, develop critical thinking skills, keep pupils engage on tasks, produce sustained and useful classroom interactions, and in general enable and enhance the learning process. Thus, it is appropriate to identify the effective teaching methods in order to improve pupils' learning outcome in the classroom lesson.

Lieberman and Wilkins (2006) conducted various researches related to professional developments in mathematics education in order to improve mathematics classroom teaching practices. Even though the interests on investigating mathematics teaching practices were increasing, they still observed that more dissatisfactions occurred in the current traditional way of teaching mathematics. Another researcher, Takahashi (2015) in his recent study contended that the most important factors for pedagogical shifts rely much on classroom teaching practices. According to Takahashi (2015), teachers need to be conversant with sufficient pedagogical skills and content knowledge while continuously

engaging themselves in various professional development models. Pennel and Firestone (1996) also asserted that the traditional professional developments programs were described as short-term, un-organized, and non-consistency programs. Yet, in the late 90s, Stigler and Hiebert (1999) suggested 'Lesson Study' as a vibrant effective Japanese teachers' professional model that could improve teaching and learning practices through reflections, understanding pupils' needs and identifying appropriate classroom teaching methods. Takahashi (2015) added that among various professional development models which were in practice, Lesson Study process has been observed to exemplify appropriate characteristics in changing mathematics teachers' teaching practices in planning the lesson, employing appropriate teaching methods, attempting explicit perspectives in teaching practices as well as affording on-site teachers support within a collegial collaborative network.

Therefore, this study intends to investigate the trend of changes in mathematics teaching methods in research lesson planning and observation during the implementation of three Lesson Study cycles in three Tamil Primary schools. The study also seeks to compare the changes in mathematics teaching methods among the three schools during the implementation of Lesson Study process.

1.1 Background of the Study

Malaysian primary education comprises of four types of primary schools: (as displayed in Table 1.1) National, National Type of Chinese, National Type of Tamil, and Special schools. Both the national type of Tamil and Chinese primary schools are also known as vernacular schools. The vernacular schools have been part of the Malaysian

education system for more than 55 years. In the year 2012, over 650,000 children attended vernacular schools and these constitute about 95% of Chinese children and about 55% of Indian children (MOE, 2012). Both types of vernacular schools are not just a focal point of teaching and learning the language but also act as community centres that assist to disseminate cultures and enrich the national heritages. The two types of vernacular schools comprise of 17.4% (National Type Chinese) and 7.1% (National Type Tamil) from the overall percentage of the four types of primary schools in Malaysia. These vernacular schools are embedded into Malaysia's Constitution and it meets the needs of the country's multi-ethnic population, with a common school curriculum and a national language approving integration (Curriculum Development Centre [CDC]: MOE, 2011).

Table 1.1

Primary schools by type in Malaysia, 2012

Type of School	**Number of schools**	**Percentage of schools**
National	5,560	75.1%
National-type (Chinese)	1,288	17.4%
National-type (Tamil)	523	7.1%
Special Schools	33	0.4%

Source: Malaysian Education Statistic Department (MOE, 2012)

According to Social Strategic Tamil Foundation (SSTF) survey report which was formed under the Malaysian Education Ministry (MOE, 2011), the first Tamil medium classes were set up as a branch school of the Penang Free School in 1816. In 1850, bilingual English and Tamil schools were set up in Malacca. Since 1870, small Tamil schools were built in estates at Province Wellesley (Seberang Perai, Penang), Malacca, and North Johor and buildings of the schools were expanded to other parts of the country. In 1923, the Labour Code was passed in the Federated Malay States, making it compulsory for

rubber estates to provide vernacular Tamil primary schools as long as there were ten plantation children of school age. Many Tamil primary schools were built after the code was enacted, mostly in rubber estates.

The main reasons for setting up these vernacular Tamil primary schools were to ensure a secure supply of labour to the rubber plantations. The setting up of Tamil primary schools gave more confidence to the Indian labourers to stay in Malaysia. A number of Tamil primary schools had been built since thousands of Indians especially those from the Southern part of India came to Malaysia as labourers to work in the rubber, tea, coffee and sugar plantations. Later in 1956, the Razak Committee was set up to bring some changes in vernacular education. This committee ensured Tamil school education whereby the schools were classified as National Type School. Tamil primary schools play an important role among the Indian community not only as a center of sharing education but also to promote Indian cultures among the community. Despite this, the roles of Tamil primary schools are equally comparable in terms of accomplishing the objective, vision and mission of National Educational Philosophy among other types of schools in Malaysian education system to produce a holistically and academically well-performed child (MOE, 2012).

Furthermore, the reformation of Malaysian education system in recent years revealed the government's efforts to adapt education up to the global development needs at all levels in order to attain the objective of becoming a developed nation by 2020 as envisaged in Vision 2020. One of the educational efforts was the Educational National Key Results Area (NKRA) which was drawn-up in 2010 under the Government Transformation Programme (GTP). The Educational NKRA (2010) has seen much effort and focus on improving its public education system by adapting four main strategies such as improving student learning outcomes, teachers' teaching practices, quality of teachers and leadership

credibility in schools. Improving the quality of classroom teaching practices have been the most important focus given by the Malaysian Ministry of Education in order to improve pupils learning outcomes. Consequently, Malaysian teachers were moulded up with various pedagogical skills during their trainings in teacher training institutes or universities (MOE, 2012). The trained teachers were continuously instructed and updated with new pedagogical knowledge and skills particularly to keep them up-to-date with current educational developments through various types of in-service training and professional development programs. It is also important and beneficial to identify and examine the challenges among the pre-service and in-service teachers face during their teaching practices in schools (MOE, 2012).

Nevertheless, the particular focus of Malaysian education system in the evaluation and assessments through public examinations was taken into special accounts in school academic performances. For example, Lim and Chiew (2015) found that Malaysian school administrators tend to utilize the pupils' academic results to compete among each other in public examinations to appraise teachers' teaching capabilities and abilities in their teaching practices. Hence, due to exam-oriented culture, particularly most of the mathematics teachers planned out their teaching methods into drill and practices in order to speed up the syllabuses (Lim & Chiew, 2015). Teachers also tended to make sure that pupils are ready, well-prepared and confident to face their public examinations. The school culture that emphasised on the examination has led to teachers having less opportunities to improve their teaching and learning skills. For this reason, there is a need for a good teacher professional development model to improve and sustain teachers' classroom teaching practices.

Besides that, Kor (2006) also observed that mathematics classroom teaching practices had not exhibited much change as it had shifted from the traditional '*chalk and talk'* to '*click, show and tell'* approaches using Information and Communication Technologies (ICT). According to Kor (2006), mathematics and science teachers were much engaged themselves in using teaching courseware where the exact interactions between teacher and pupils were neglected. She further contended that when the entire classroom lesson using this kind of teaching approaches pupils might lack in confidence and the learning outcomes might not been achieved. Mathematics teachers should work together and afford chances for pupils to achieve the learning outcome and produce a quality classroom teaching and learning practices. Therefore, a strong need exists to promote good teaching practices in order to enhance collaborative collegial networks among the Malaysian mathematics teachers.

The SSTF (2011) had highlighted four important problems that lead to the falling factors of Tamil primary schools (MOE, 2010). According to the report, the problems arise due to shortage of trained and graduate teachers; 63% of the 523 Tamil primary schools in Malaysia were under enrolled schools with less than 150 students in rural areas whereas urban areas do not have sufficient schools; schools endured with land related issues; and lack of facilities and amenities for proper implementation of curriculum in these schools. Even though the Tenth Malaysia Plan, (2011-2015) targeted about 60% of graduate teachers to be employed in all primary schools by 2015 yet shortages of trained teachers exist in Tamil primary schools. Student learning outcomes were determined by teachers' teaching quality (Kilpatrick, Swafford & Findell, 2001). Data showed that 19% of the teachers are university graduates and more than 18% were un-trained teachers currently working in Tamil primary schools (SSTF, 2011). The un-trained teachers with minimum

secondary level education were appointed in these primary schools to overcome the shortage of trained teachers. Another 63% of the teachers were college-trained teachers with diploma qualifications. Most of these teachers were with Malaysian Certificate of Education (MCE) qualifications. They were employed to fulfil the gap of teachers' shortage in Tamil primary schools. Yet, Tamil schools were still occupied with un-trained teachers with their basic knowledge from their previous experiences as a student in school. Unfortunately, these teachers' classroom teaching qualities had affected the overall academic performances of Tamil primary schools (SSTF, 2011). Furthermore, the current in-service trained teachers mostly major in Tamil Language and minor in other subjects (SSTF, 2011). Most of the mathematics teachers in these schools were not majored in mathematics but they were appointed by the school administrators to teach the subject.

About 63% out of 523 Tamil primary schools were under enrolled with less than 150 students. The enrolment rate of students in many rural area schools has been decreased drastically due to the rapid development projects in the country. Most of the estate plantation community has been largely displaced to urban areas. Many schools are still located in rural plantation sites with lower enrolment of students. About 68 Tamil schools are with less than 25 students (SSTF, 2011). The students in these schools are from the moderate to poor social economical background which is one of the most important factors that hinder their academic performances. Moreover, only few numbers of schools in urban areas were highlighted by SSTF (2011) accommodated the highest population of students displaced from the estates and plantations sites. Apart from these factors, lacking of sufficient facilities and amenities in the schools affected the accomplishment of proper curriculum implementation. Some schools were observed faltered with land related issues. According to the SSTF (2011) data, about 71% of Tamil primary schools were government

aided schools and involved in land related issues. The school administrators, teachers, and parents have to struggle with these problems such as ownership of the school land. Due to these factors, teaching and learning process was partly overlooked by these school administrators. These have been discouraging factors for the Ministry of Education to upgrade the basic facilities in these schools. According to SSTF (2011) report, schools without sufficient number of pre-schools, multiple laboratories, staff rooms, meeting halls and even fields for the pupils to play around still exist. Tamil primary schools observed to be striving to improve teachers' teaching qualities as well students' academic performances in the midst of these identified problems. The quality of an education system always could not exceed the quality of its teacher (Mc Kinsey & Company, 2007). They also asserted that improving the classroom instructional strategies will lead to higher performing pupils. Therefore, accordingly, it is important to focus on teachers' teaching practices in order to enhance pupils' learning outcome.

With that, the need for professional development for teachers in Malaysia was recognised as early as 1995 by the special committee set up by the Ministry of Education (MOE, 2012) mainly to look into teachers' professionalization, professionalism and professional development. Among the recommendations put forward in our education system were (i) teachers should be encouraged to attend in-service courses; (ii) teachers should be motivated to continue their education; (iii) opportunities should be given to teachers for study visit overseas to explore the current development in education (iv) newly appointed teachers should be given induction programmes (v) management courses should be provided to those teaches who have been promoted as school administrators (vi) staff-room should be set-up as subject-based and (v) teacher centres should facilitate the professional development of teachers which should be conducted in strategic locations;

equipped with modern technology facilities; fully-funded and adequately staffed. (Mohd. Sofi Ali, 2002). In conjunction with the above recommendations, the government has made some efforts to start centres for the teachers. The Teacher Education Division (TED) which comes under the Ministry of Education (MOE) and Ministry of Higher Education (MOHE) initiated both pre-service and in-service training programs for the teachers. Both school-based and non-school based trainings were the two common ways practiced among the current Malaysian in-service teachers. It was aimed to train and expose teachers within a short period of time within lower budgets. Apart from this, the school-based training programs were an on-site and initiated at the school level depending on the school needs. Therefore, a need exists for the emergence of various teacher professional developments which could further assist and strengthen teachers' teaching and learning skills continuously.

Hence, as Takahashi (2015) suggested teacher professional development programs should be designed to address 'learning by reading; listening and seeing; and learning through planning, doing and reflecting'. This characteristic exactly suits the Japanese teachers' professional development model called Lesson Study process. Lesson Study is a direct translation of the Japanese term *jugyo-kenkyu*, which composed of two words: *jugyo,* which means lesson and *kenkyu* means study or research (Fernandez & Yoshida, 2004). Lesson study is an inquiry model of teacher professional model consisting of the study or examination of teaching practice which was used extensively throughout Japan for over a hundred years (Lewis & Tsuchida, 1998). Japanese teachers engage in a well-defined process that involves discussing lessons that they have first planned and observed together. When Lesson Study (LS) was highlighted in the book titled *The Teaching Gap* (Stigler & Hiebert, 1999) as one of the attributes of successful lesson by Japanese mathematics

teachers, it caught the attention of mathematics educators around world-wide. Lewis (2004) stated that in Japanese Lesson study model, the teachers seek to improve by focusing on the goals of classroom lesson and long-term goals for the pupils, deepening the teachers' knowledge of developing instructional expertise and developing the eyes to see children (*kodomowomirume*). The Lesson study process in this study refers to how the study lessons were carried out during its implementation in schools. Further, Fernandez and Yoshida, (2004, p.22) summarized six steps involved in the Lesson Study process as below:

Step 1: Collaboratively planning the study lesson

Step 2: Seeing the study lesson in action

Step 3: Discussing the study lesson

Step 4: Revising the lesson (optional)

Step 5: Teaching the new version of the lesson (optional)

Step 6: Sharing reflections about the new version of the lesson

In brief, a group of teachers consist of four to five meet regularly and collaboratively plan, refine, teach, observe, reflect, revise and optionally re-teach the lesson. Even though Lesson Study process is straightforward but it is self-directed or up to the teachers to make it exclusive and vary from other types of professional development programs (Wang-Iverson & Yoshida, 2005).

1.2 Statement of the Problem

The problems of pupils disliking mathematics and the declining rate of majoring in mathematics still the main concern of every teachers, educators, mathematicians and parents around the world (Dick & Rallis, 1991). Therefore, various efforts and ways are taken to improve classroom teaching and learning processes (Richardson & Placier, 2001). The latest results of Trends in International Mathematics and Science (TIMSS) results in year 2011 which was released on the 11th of December 2012 showed a worrying and unacceptable drop in Malaysia's ranking and the average scores in mathematics (Foy, 2013). According to TIMSS report, the ranking of Malaysian pupils' in mathematics decreased from the 20th in year 2007 to the 26th in year 2011. The average score in mathematics also decreased from 474 in 2007 to 440 in 2011 as displayed in Table 1.2.

Table 1.2

Malaysia's TIMSS ranking and average score of 8th grade in mathematics

	1999	**2003**	**2007**	**2011**
Ranking	16	10	20	26
Average Score	519	508	474	440

Source: International Association for the Evaluation of Educational Achievement (IEA, 2012)

According to TIMSS (2011) results, the Malaysian 8th grade pupils failed to meet the minimum benchmarks for mathematics when compared to the results across countries which participated in TIMSS study. The failure rates of Malaysian 8th grade pupils particularly in cognitive domain demonstrated that the secondary level mathematics

education still need improvements in terms of quality performances in mathematics assessments. Thus, the basic level of mathematics performances in primary schools is important in order to improve secondary and tertiary levels in mathematics achievements (Hasbee, 2009). In regards to the drastic drop in mathematics achievements, the Evaluation of Educational Achievement (IEA, 2012) had revealed some possible factors: home environments; school resources; pupils' background; insufficient facilities, books and technologies; teacher working conditions; school climate; teacher preparations in classroom instructions; and teachers' and pupils' confidence level in mathematics. Therefore, the teacher preparation factor in classroom instructions attracts the researcher to further this study in Malaysian Tamil primary school context.

According to Nik Aziz (2003), mathematics teachers must know and understand the school mathematics curriculum and able to understand the pedagogical content knowledge during their classroom teaching practices. Teaching practices is part of the classroom contributions which are equally important as the other school factors such as in order to enhance a quality education and to produce highly skill pupils (Stigler & Hiebert, 1999). Hence, every teacher must master multiple methods in teaching their subjects in order to be more effective and creative in teaching and learning processes. In this sense, planning a good lesson, identifying appropriate teaching methods, teaching resources, proper assessments and continuous teacher professional development activities are important in any teaching practices.

The Teaching and Learning International Survey (TALIS) also reported that a few teachers' factors such as non-punctuality in entering classrooms, absence rate of teachers to school and low pedagogical teaching knowledge among the teachers led to the decreasing

rate of the pupils' learning outcome (OECD, 2010). The falling rates of pupils performances in schools compared among four countries displayed in Table 1.3.

Table 1.3

Teachers' factors in school climate

Countries	Non Punctuality	Absence	Lower Pedagogical Knowledge
Australia	7.8%	22.9%	35.8%
Malaysia	**13.2%**	**19.5%**	**30.2%**
Korea	17.8%	23.3%	33.8%
Iceland	14.1%	24.0%	12.7%
TALIS (Average)	**15.3%**	**25.8%**	**24.1%**

Source: *Organisation for Economic Co-operation and Development* (OECD), 2009.

In regards to the teachers' factors as mentioned in Table 1.3, about 30.2% of Malaysian teachers were reported to have lower pedagogical knowledge in schools. These results exceeded the average percentage of TALIS 24.1%. Therefore, it is pertinent to explore why the problem exists and how to overcome this problem in order to improve and produce a quality classroom lesson particularly in mathematics teaching practices.

Consequently, in the context of mathematics education, pupils' learning outcomes were determined by teachers' teaching quality (Kilpatrick, Swafford & Findell, 2001). Hence, it is imperative for the policy makers in Malaysian Education Ministry to focus on mathematics teaching practices particularly in planning and teaching the lesson in the classroom context. A good lesson planning with suitable teaching and learning activities is important in order to produce a quality generation of pupils (Kilpatrick, Swafford & Findell, 2001). Yet, problems in Malaysian schools were also highlighted by Lim (2006) that the 'examination culture' in schools caused most of the mathematics teachers to be less focused on improving their teaching practices in the classroom. Teachers in Malaysian schools tended to drill the pupils to ensure higher achievement rates in public examinations

particularly in mathematics. Mathematics teaching practices generally were observed as a 'drill, practice and memorize' subject matter in schools (Lim, Fatimah & Tan, 2002). Therefore, a careful lesson planning is an urgent need to change current mathematics teaching practices which appear to be a tough challenge in mathematics education in order to prepare the pupils towards 21st century skills.

Nonetheless, Tamil primary schools which were hindered with under enrolment factors, lack of facilities and land owner-ship issues as highlighted by SSTF (2011) were observed to influence the entire school community. The administrators and the subject heads faced with non-academic issues (SSTF, 2011). Moreover, small number of teachers in Tamil primary schools (SSTF, 2011) also observed loaded with more administrative workloads apart from their core task in classroom teaching practices. Therefore, teachers in these schools were constraint with time factor to commit and participate in any professional development programs apart from their normal classroom teaching and learning activities. For example, Chiew (2009) revealed in his study that Malaysian primary school teachers still found to implement the traditional teaching methods in the classroom even though many in-service programmes were conducted *in-site* or *on-site* the schools. Therefore, the practising mathematics teachers in Malaysian primary schools are still yet to practice various pedagogical practices in their classroom teaching practices mainly in terms of planning and teaching the lessons.

Consequently, teachers in most of the primary schools particularly mathematics teachers were noticed rushing to complete the syllabuses in order to prepare their pupils for the final examinations in schools (Lim, 2006). Teachers' efforts on improving pedagogical content knowledge and skills in planning were not much observed even though were advocated in our Malaysian mathematics curriculum in recent years. Moreover, these

teachers showed less interest in sustaining a collaborative team-work during planning and conducting their lessons in schools (Chiew, 2009). In the context of researcher's personal experiences in teaching mathematics for the past 21 years in three Tamil primary schools, she also observed that experienced mathematics teachers always prefer to *'plan and teach'* on their own. The experienced mathematics teachers tended to plan their own lesson plan based on their past teaching experiences. While the novice teachers sometimes observed to approach the experienced ones for a help related to mathematics lessons. Therefore, a collaborative team work is much less seen in Tamil primary schools.

Changing and improving mathematics teaching practices sometimes appear to be a tough challenge in mathematics education (Lim & Fatimah and Tan, 2002). They asserted that a collegial support is important towards a positive impact in teaching and learning mathematics. Perhaps, the role of *school mathematics subject panel* in most of the schools includes Tamil primary schools were noticed only focus in their yearly pupil activities, performances in mathematics and meetings whereas not much attentions on improving teachers' pedagogical practices. For example, Ong (2010) in her study investigated the changes in mathematics teachers' questioning techniques in terms of probing and factual questioning when teaching mathematics. Further, Ong (2010) also stated the differences in questioning techniques among the novice and experience mathematics after the implementation of Lesson Study process a Japanese teacher professional development model. Subsequently, issues related to existing teacher professional development programs in practices is another important factor addressed in reforming mathematics teaching practices when various in-service programs and short-courses were conducted by Malaysian Ministry of Education (MOE). For example, Chiew (2009) investigated on how Lesson Study process had influenced mathematics teachers' pedagogical content

knowledge and their reflective practices. Chiew (2009) highlighted that various school-based factors that support and hinder the implementation of Lesson Study process such as teachers' attitudes towards the acceptance of new professional development practices, teachers' declination towards a collaborative team work, teachers' administrative workloads, and the school focus on examination culture .

As suggested by Chiew (2009), a Japanese teacher professional development model has demonstrated some positive changes could be an alternative model basically to improve and change mathematics teaching practices in Malaysian primary schools. Yet, no studies were revealed on teachers' planning and the implementation of mathematics lesson using Lesson Study process. Therefore, an alternative school-based professional development model is needed to address the problems in terms of planning and teaching mathematics lesson on teachers' perspective. This study aimed to identify the trend of changes in mathematics teaching methods between research lesson planning and observation using Lesson Study process as an effective teacher professional development model.

1.3 Research Objectives

The objective of this study sought to identify and compare the trend of changes in mathematics teaching methods between research lesson planning and observation which were conducted in three Tamil primary schools during the implementation of Lesson Study process. More specifically, the objectives were:

1. To identify the trend of changes in mathematics teaching methods in terms of
    a) Research lesson planning and
    b) Research lesson observation

2. To compare the changes in mathematics teaching methods among three primary schools in terms of
    a) Research lesson planning and
    b) Research lesson observation

1.4 Research Questions

1. What are the trend of changes in mathematics teaching methods in terms of
    a) research lesson planning and
    b) research lesson observation

2. What are the similarities and differences in mathematics teaching methods among three primary schools in terms of
    a) research lesson planning and
    b) research lesson observation

1.5 Significance of the Study

This study revealed the changes in teaching methods employed in an actual mathematics research lesson inclusive of instructional methods such as whole class discussion, demonstration, explaining and guiding, drill and practice, posing problems, interactive activity approaches and other pedagogical approaches identified in the research lesson during the implementation of Lesson Study process. Therefore, the findings hoped to reveal both lesson planning skills and teaching methods employed during the research lesson while participating in Lesson Study process.

Stigler and Hiebert (1999) stated that most professional development efforts fail to improve education because they are not classroom based. The professional significance of lesson study is a way to impact the quality of teaching practices inside the classroom.

Lesson study process differs from many other models of classroom action research or enquiry based models. Lesson study has also shown promising results especially in Japan, United States and other Asian countries. Hence, this study also aimed to explore if similar impacts of Lesson study process exists in the Malaysian primary classroom context. By engaging the mathematics teachers of three Tamil primary schools in Lesson Study process, the study hoped to provide clearer understandings on how it has changed their teaching practices in terms of planning of the research lesson specifically on the lesson opening, concept development and lesson ending.

The findings of this study would provide some ways to improve and overcome the constraints, and challenges that have been obstructing the participant teachers during their participation in Lesson study process. With the benefits and knowledge gained while participating in Lesson Study process, hopefully this effort may generate strong interest, encourage and motivate the school in-service teachers, school administrators; policy makers; and also researchers to promote this effective professional development model as a long-term strategy throughout the nation.

Finally, there is a tendency to promote practising teachers to become researchers in classroom teaching practices through this study. While participating in Lesson Study process teachers could learn a way of communicating and organizing their knowledge base. According to Saul (2001), after participating in Lesson Study process, teachers would have a way of sharing that knowledge base with their colleagues in a collaborative and reflective manner. Hiebert, Gallimore and Stigler (2002) also argued that Lesson Study is seen as a research process. Hence, this study would reveal that after participating in Lesson Study process the changes in transforming informal knowledge into professional knowledge will

definitely promote an effective path for all teachers, administrators, policy-makers and researchers in enhancing teaching practices in the mathematics classroom lesson.

1.6 Limitation of the Study

There were three limitations identified in this study that need to be acknowledged. First, due to time constraint, the study which was conducted in two years only managed to carry out three LS cycles in all the research schools. As noted by Takahashi (2013) that "the visible impacts of Lesson Study may not be detectable until the teacher's experience multiple Lesson Study cycles even when they are given sufficient support from their facilitators and knowledgeable others" (p.80). Hence, only three LS cycles may not be sufficient to observe many changes in mathematics teaching practices among the three research schools.

Second, the impacts of Lesson Study in this study might have constrained by the teachers' awareness about the importance of teacher professional developments (Chiew, 2010) and subsequently their commitment. Chiew (2010) observed that many Malaysian teachers still failed to realise the need and importance of improving their existing teaching practices. His study on promoting LS in two secondary schools also indicated that many teachers see LS as another extra workload apart from their normal commitments in school. Likewise, in this study, many participant teachers did not commit fully as they were merely follow top-down instructions from their Head of Departments and school administrators. Consequently, this lack of full commitment from the participant teachers might have resulted in less impact of LS to be seen in this study.

The third limitation addressed in this study was the lacking of collaborative working spirits among the participant teachers. Collaborations among teachers are important in LS